Trans. Inst. Indian Geographers
Vol. 5, No. 1, January 1983

THE COASTAL DUNES AND THE DUNE BUILDING PLANTS OF KALBADEVI SPIT BAR, MAHARASHTRA, INDIA

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ABSTRACT : The Kalbadevi spit bar, some six km north of Ratnagiri city, Maharashtra, is an example of unusually wide littoral formation in the nearby area. The spit bar is characterised by a 60 metre wide beach, backed by a still wider, 120 metre wide dunal zone.

The coastal dunes is a well marked and distinct featurec of this area. Dunes adjacent to back shore, showing characteristic wind ripples and stabilised secondary dunes occuring as series of parallel ridge lines extending upto salt marsh can be easily recognised. The foredunes, the backdunes and the dunes on the interdunal flat present a varitable aspect as regards their morphology, orientation and association with the dune plants. The present study tries to bring out the significance of microenvironment of the dunes that changes with the hydrogen ion concentration of the sands, to the dune plants.

The beaches on the west coast of India are generally identified as the pocket beaches. Their incospicuousness is attributed to their smaller north south as well as east west extent (Ahmed, 1972).

The transverse profile of these can be conveniently divided into foreshore, backshore and beach dune zones. All these zones are very narrow and merge into each other imperceptibly. At many places it appears that all the three sections mentioned above are compressed in a distance of only 40 to 50 metres. Moreover, the coastal dunes at many places are getting lowered at a faster rate and hence losing their conspicuousness.

The Kalbadevi spit bar about six km north of Ratnagiri is a classic example of a relatively wider sedimentary formation where a complete beach profile is retained almost undisturbed. The lower beach and the upper beach components are slightly wider than those found elsewhere in the nearby areas. What strikes immediately to the mind is the wider area occupied by the coastal dunes. These dunes corden the upper beach and parallel the shoreline. Unlike the dunes of nearby area, they do not maintain a low profile and stand out prominently from the general beach level. They are scattered over an east west distance of 100 metres.

Morphology

Three distinct north south running ridge lines can be traced easily on this dunal zone. The foredunes (outer and seaward) and the backdunes (inner and landward) are relatively higher than the central dunes. The foredunes actually form a dune wall sloping steeply towards the sea and gentle towards the land. The backdunes are more or less symmetrical and slope gently in all the directions. The backdunes, although appear to be scattering every where, give an impression that they are the remanents of a previous fore dune line (Fig. 1).

The central dunes are slightly difficult to describe, firstly because of their insignificant height and secondly because of their indefinate shape and alignment. These dunes occupy the interdunal flat between foredunes and backdunes and have grown out of the sand blowing in, in a haphazard manner.

All dunes, inner, outer and central are covered by dune plants which either from a thin sheet like a mat or stand in groups forming patches. What is important is that the plants all over the dunal zone are not alike and show a distinct variation in type and form from the forednues to the backdunes.

The interdunal flat is dotted with a number of small circular depressions where thin grass grows. Considering the height, the density and the form of plants growing on the dunes, the foredunes can be classified as the primary dunes. The accretion of the sand and the building of these dunes is impeded due to the thorny shrubs which are poor sand trappers.

Althongh the foredunes form a wall like barrier along the beach they seem to be basically nucleus oriented. That is to say that their growth is favoured at a certin point where there is a sudden drop in the velocity or where there are small thorny shrubs intiating the accretion of the sand particles. It appears that the latter condition is responsible for the building of these foredunes, as the wind blown sand can easily reach farther inland upto the central dunes.

The central dune line can be traced on the interdunal flat. Here, less stable, drier, wind blown sand has accumulated and given rise to low dunes. Generally these dunes are perpendicular to the foredune ridge. The low central dunes are covered under a thin mat of Ipomoea plants.

The backdunes are also relatively prominent but are eroded and discontinuous. Here the sand is less mobile and readily settles down. In fact this might be the older foredune ridge when the sea level was seightly higher than the present one. One can classify these dunes as the secondary ones which are either lithified or stabilised. The most significant aspect of of these dunes is their internal horizontal bedding structure and distinct lithification marks. It almost certainly suggests that these dunes are the product of ancient sedimentation processes and have remained in the landscape since the last fall of sea level. They are beyond the reach of present day wind and wave effects. Moreover the cohesiveness and compactness of the sand grains in these dunes confirm the view expressed above.

The Dune Plants

As has been pointed out earlier, the major aspect of the dunal zone is the dune vegetation. Ipomoea creepers are the main plants which stretch over a wider dunal zone.

The close examination of these plants, however, reveals that the Ipomaea Creepers are dence over the interdunal area. Elsewhere they are replaced by rosetle plants, thorny shrubs or deep rooted perennials.

Thorny shrubs grow on the leeward of the foredune wall, the area being comparatively more drier and sand grains less mobile. This type of a environment helps the plants sending their roots deep into the dunes. These shrubs and deep root perennials help build the dunes throughout the year. The plants are scattered and nowhere assume a dense aspect.

The secondary back dunes are different from the others in that these peripheral and basal parts are covered under rosetle plants. These rosetle plants are microscopic and do not help much in trapping the sand. It was also observed that these rosetles grow more in the drier season and diminish in number in wet monsoon period.

The bigger and higher secondary dunes are characterised by the growth of plants. The casurina trees occupy the leeward slopes and the trees with a distinct rhizome system occupy higher and windward slopes, These latter trees can act as a very effective

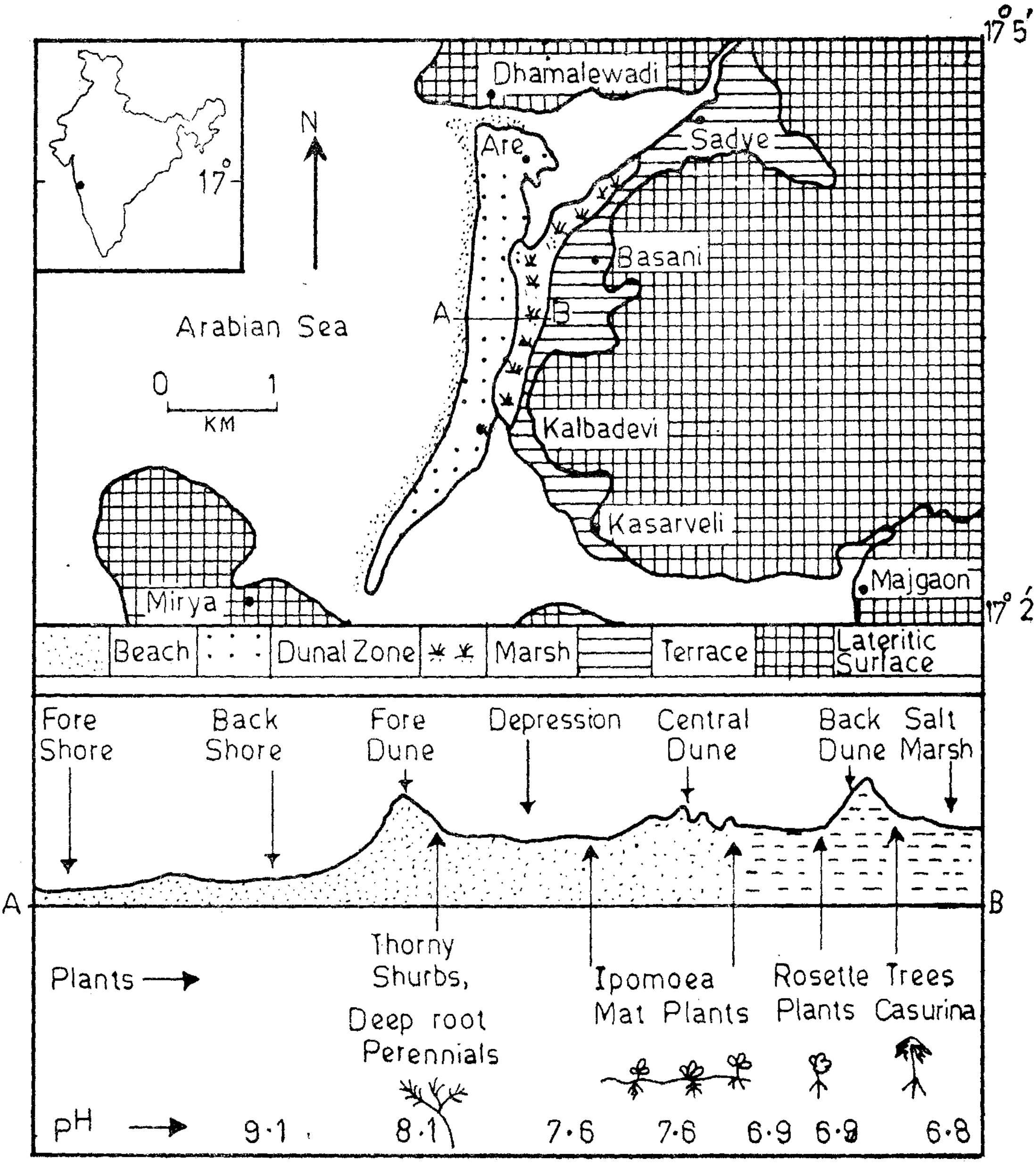

Fig. 1

screen to the sand grains. However these dunes, in this area are away from the reach of present day sand carrying winds and hence the rhizotomus trees do not play any role in building the dunes.

The Dune Plants and the PH of Sand Dunes.

Samples of the dune sand were collected from fore dunes, central dunes and backdunes and the hydrogen ion concentration (pH) was determined. To get a complete sepuence of pH variation samples were also collected from lower beach and upper beach and pH determined.

It was noted that the pH of the sand shows a regular sequence of variation wherein the pH more than 9 indicates a basic environment near the lower beach, pH 6.9 indicates neutral environment around secondary dunes and pH less than 6 indidated a acidic environment near the salt marshes.

It can be seen that there is a distinct association of pH and type of dune plant. The zone of secondary dunes is an area of neutral enviroment as indicated by pH value of 6.9. This may be so because it is relatively away from the present day wave impact and comparatively older where lithification has continued for a long time and the intensity of lime content has been greatly reduced. This type of a neutral dune environment seems to be favourable for the growth of rizotomus plants, and rosetle plants. The microenvironment is disturbed to an appreciable amount in wet monsoon period, thereby changing the dune environment to basic conditions. One may argue that this type of a change is reflected in the reduction in the number of rosetle plants, which are not strong enough to sustain this change.

The interdunal area, with pH ranging between 7 to 7.6 is probably favourable for the growth of Ipomoea plants. Likewise the characteristic thorny shrubs and deep rooted perennials of foredunes can be related with basic environment with pH ranging between 8 and 9.

Such an association between pH, the form and the type of dune and the vegetation growing around, is difficult to establish in nearby areas especially where beaches are narrow and dunes are restricted to an elongated and limited stretch of land.

Conclusion

To summarise it can be said that the variation in the accretion and growth of coastal sand dunes, in an area like Kalbadevi spit, is mainly governed by the varying aspect of dune plants. In an area where the sand supply is not considerable and relative humidity about 70% throughout the year, one expects a meagre growth of dunes. Better dune development is generally seen where there is a major obstacle to moving sand in the form of a cliff of a tree line. In the absence of such things one can only attribute the growth of dunes to smaller dune plants scattered all over the area. The rich floristic zonation is accounted by the microenvironment of dunes, that changes with the change in the hydrogen ion concentration of the sandy substratum.

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